Atlantic Menhaden Stock Assessment Terms of Reference
For SEDAR 20 Review

1. Evaluate precision and accuracy of fishery-dependent and fishery-independent data used in the assessment:
    a. Discuss data strengths and weaknesses (e.g. temporal and spatial scale, gear selectivities, aging accuracy, sampling intensity).
    b. Report metrics of precision for data inputs and use them to inform the model as appropriate.
    c. Describe and justify index standardization methods.
    d. Justify weighting or elimination of available data sources.
2. Evaluate models used to estimate population parameters (e.g., F, biomass, abundance) and biological reference points.
    a. Did the model have difficulty finding a stable solution?
    b. Were sensitivity analyses for starting parameter values, priors, etc. and other model diagnostics performed?
    c. Have the model strengths and limitations been clearly and thoroughly explained?
    d. Have the models been used in other peer reviewed assessments? If not, has new model code been verified with simulated data?
    e. Compare and discuss differences among alternative models.
3. Evaluate the potential for conducting assessments at a sub-regional level (e.g. Chesapeake Bay).
4. State and evaluate assumptions made for all models and explain the likely effects of assumption violations on model outputs, including:
    a. Calculation of M.
    b. Choice to incorporate constant or time-varying M and catchability.
    c. Choice of selectivity patterns.
    d. Choice of time steps in models.
    e. Error in the catch-at-age matrix.
    f. Choice of a plus group for age-structured species.
    g. Constant ecosystem (abiotic and trophic) conditions.
    h. Choice of stock-recruitment function.
    i. Choice of reference points (e.g. equilibrium assumptions).
5. Evaluate uncertainty of model estimates and biological or empirical reference points.
    a. Choice of weighting likelihood components.
6. Perform retrospective analyses, assess magnitude and direction of retrospective patterns detected, and discuss implications of any observed retrospective pattern for uncertainty in population parameters (e.g., F, SSB), reference points, and/or management measures.
7. Recommend stock status as related to reference points.
8. Develop detailed short and long-term prioritized lists of recommendations for future research, data collection, and assessment methodology. Highlight improvements to be made by next benchmark review.